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SYNTHESIS OF SOME NEW 3,6- DIHETEROARYL-1,2,4-TRIAZIN-5-ONES AND THEIR EFFECT ON AMYLOLYTIC ACTIVITY OF SOME FUNGI

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Some new 3-thioxo-6-(2-arylidinephenyl)- 1,2,4-triazin-5-ones (IIa-n) have been synthesized. Aminolysis and hydrazinolysis of II followed by acylation and alkylation reactions gave 3-heteroaryl-6-(2- arylidinephenyl)-1,2,4-triazin-5-ones (IV- VII), 3-mercapto-s-triazolo [4,5-d][1,2,4] triazinothion(X) and 3-mercapto-s- triazolo[3,4-b][1,2,4] triazinone (XI). Reactions of II with mercaptoacetic acid and thiophenol derivative have been reported. The structure of the compounds prepared have been established by their elemental analysis, IR, UV and PMR spectral data. The effects of the new compounds on amylolytic activity of some fungi are also described, compounds IIa, III, XIV and XVIa showed very high activity.

Key words: 3,6-Diheteroaryl-1,2,4- triazinones, Amylolytic activity of some fungi.

Introduction

Antimicrobial and antihelmintic 3-thioxo-6-(2-aminophenyl)-1,2,4-triazin-5-one (I) and its 3-methylthio derivative, which is useful as dye intermediates are known [1]. In view of this, we have now undertaken the synthesis of some new 3-thioxo-6-(2-arylidinephenyl)-1,2,4-triazin-5-ones containing biologically active groups such as mercapto, amino and hydrazino. On cyclization, they gave various 3,6-diheteroaryl-1,2,4-triazin-5-ones. Some of these compounds have been evaluated for their effect on amylolytic activity of some fungi such as, *A. flavus, A. fumigatns, A. nidulaus, A niger, A. terreus, A. terricola, P. chermesimum, P.chrysogenum, P. funiculosum, P. meleagrinum and M. spinosus.*

Results and Discussions

3-Thioxo-6-(2-arylidinephenyl)-1,2,4-triazin-5-ones(IIa-n) have been synthesized by condensation of 3-thioxo-6-(2-aminophenyl)-1,2,4-triazin-5-one(I) with various aldehydes and ketones in abs. ethanol. A few displacement reactions of the thioxo group in II were also investigated. Thus, 3-arylamino-6-(2-arylidinephenyl)-1,2,4-triazin-5-ones (IIIa-c) were obtained by interaction of (IIa) with primary aromatic amines in the presence of isopropyl alcohol. The IR spectra of (III) showed stretching frequencies of the NH band with disappearance of the SH band. Additional evidence for the structure of the products was obtained from acylation and alkylation of (IIIa-c) with chloroacetyl chloride and monochloroacetic acid in the presence of aq. sodium hydroxide[2] to give the isomeric systems IVa-c and Va-c. The ultraviolet spectrum gives us a good deal of information about the structure of IV and V. The shift in wavelength λ at pH 13 is diagnostic for a phenol (IVa) and the intense K-band at 265 nm is indicative of a chromophore conjugated with the ring. Furthermore, the solubility of IVa in aq. sodium hydroxide is freely than Va.

Refluxing (IIIa-c) with gl. acetic acid fused sodium acetate and/or CS_2 in the presence of aq. potassium hydroxide [3] led to the direct formation of 2-methylbenzimidazole (VI) and or 2- mercaptobenzimidazole(VII) derivatives. On the other hand, treatment of (II) with hydrazine hydrate in cold isopropyl alcohol [4] gave 6-(2-arylidinophenyl)-5-hydrazino-5-hydroxy-3- mercapto-1,2,4-triazines (VIII), while when refluxing for 6 hr it gave 3-hydrazino-6-(2-arylidinephenyl)-1,2,4-triazin-5-one (IX). Proof of the structure for compounds (VIII) and (IX) was provided by their formation of 3 hydroxy-5-mercapto-s-2H-triazolo [4,3- d][1,2,4] triazin-3-thione (X) and 6-(2-aminophenyl)-3- thioxo-1,2,4-triazin-5-one (XI) respectively, when refluxed with CS_2 in aq. KOH. The IR spectrum of (VIII) showed strong bands at 3450 (OH), 3350 (NH_2), broad bands at 3200, 3100 (NH^4, NH^2), 2700 (SH), 1640 (def. NH_2), 1620, 1580 (C=N), 1450 (def. CH), 1360 (N-CS-N), 1250 (C-N), 1180 (C-S), 1000, 900 cm^{-1} (*o*-substituted phenyl), while that of exhibited the same absorption bands as (VIII) with disappearance of the NH_2 and NH_2 deformation bands.

The reaction of (IIg-i) with benzoic acid hydrazide gave N^1- benzoyl-N^2-substituted hydrazines (XIIa-c), which underwent acidic cyclization (gl. acetic acid) to form 3-phenyl-s-triazolo [4,5-b][1,2,4] triazinones (XIIIa-c).

Condensation of mercaptoacetic acid [5] with IIn in dry dioxan- fused Na_2SO_4 gave the *bis*-thiazolidin-4- one derivative (XIV), while addition of mercaptoacetic acid [6] to 3-imino-indol-2-one

(IIi) under the same conditions gave the spiro compound (XV). On the other hand, fusion of (IIa, IIj) and (IIk) with *p*-chlorothiophenol, led to the direct formation of thioether derivatives (XVIa-c). Alkylation of IIa using MeI in the presence of aq. KOH gave the methylthio derivative (XVII).

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TABLE 1. CHARACTERISATION DATA OF VARIOUS COMPOUNDS PREPARED.

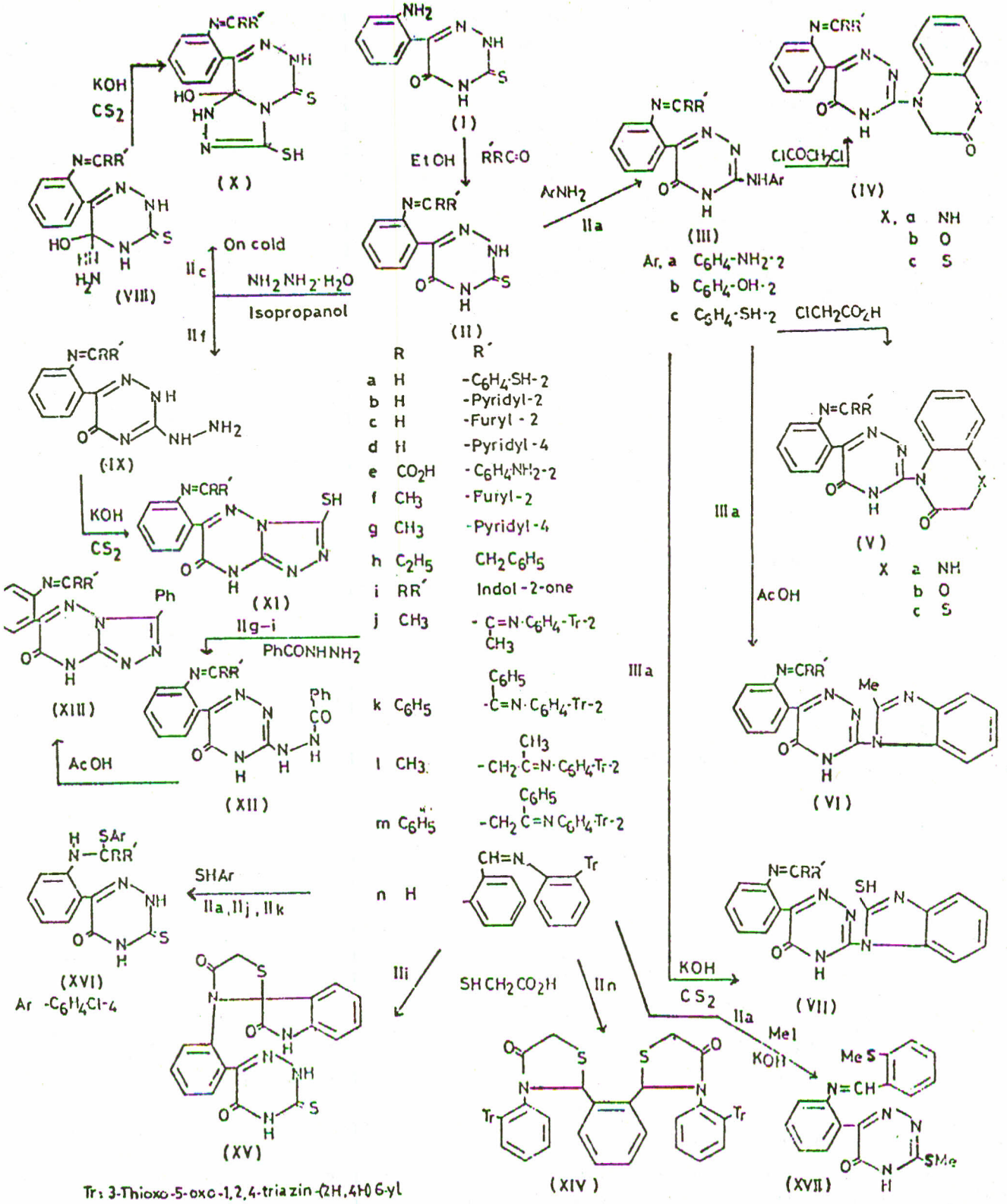
Compd. No.	M.p.	Mol. Formula*	IR Spectra of some new compound (υ cm^{-1}) OH	NH^4	NH^2	SH	CO	C:N	C:N	CH	NCSN	C:N	C:S	O-Subs Ph.	
IIa	245	$C_{16}H_{12}N_4S_2O$	3420	3280	3170	2700	1680	1610	1590	1460	1350	1230	1140	1050	900
IIb	ab310	$C_{15}H_{11}N_5S\ O$	3400	3250	3150	2700	1680	1610	1590	1460	1350	1280	1130	1020	850
IIa	270	$C_{14}H_{10}N_4S\ O_2$	3450	3210	3090	2700	1710	1620	1590	1420	1320	1250	1150	1010	750
IId	230	$C_{15}H_{11}N_5S\ O$	3470	3220	3090	2680	1680	1620	1600	1420	1320	1260	1170	1000	850
IIo	260	$C_{17}H_{13}N_5S\ O_3$	—	—	—	—	—	—	—	—	—	—	—	—	—
IIf	175	$C_{15}H_{12}N_4S\ O_2$	3450	3290	3190	2580	1690	1610	1580	1430	1320	1250	1150	1010	980
IIg	255	$C_{16}H_{13}N_5S\ O$	3450	3380	3180	2620	1680	1610	1580	1480	1320	1270	1170	980	800
IIh	ab310	$C_{19}H_{18}N_4S\ O$	3450	3350	3180	2550	1690	1610	1580	1480	1320	1270	1180	980	800
IIi	240	$C_{17}H_{11}N_5S\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
IIj	ab310	$C_{22}H_{18}N_8S_2\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
IIk	ab310	$C_{32}H_{22}N_8S_2\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
III	230	$C_{23}H_{20}N_8S_2\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
IIm	ab310	$C_{33}H_{24}N_8S_2\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
IIIn	250	$C_{26}H_{18}N_8S_2\ O_2$	3440	3290	3200	—	1730	1600	1540	1440-	1380	1210	1120	950	850
IIIa	255	$C_{22}H_{18}N_6S\ O$	—	—	—	—	—	—	—	—	—	—	—	—	—
IIIb	250	$C_{22}H_{17}N_5S\ O_2$	3380	3280	3150	2700	1650	1620	1580	1450	1300	1210	—	920	850
IIIc	200	$C_{24}H_{17}N_5S_2\ O$	—	—	—	—	—	—	—	—	—	—	—	—	—
IVa	275	$C_{24}H_{18}N_6S\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
IVb	160	$C_{24}H_{17}N_5S\ O_3$	—	—	—	—	—	—	—	—	—	—	—	—	—
IVc	175	$C_{22}H_{17}N_5S_2\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
Va	280	$C_{24}H_{18}N_6S\ O_2$	3450	3250	3150	2700	1650	1600	1590	1490	1300	1200	—	990	770
Vb	ab310	$C_{24}H_{17}N_5S\ O_3$	—	—	—	—	—	—	—	—	—	—	—	—	—
Vc	155	$C_{24}H_{17}N_5S_2\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
VI	260	$C_{24}H_{18}N_6S\ O$	3400	3250	3150	2700	1650	1620	1570	1460	1330	1250	—	850	790
VII	ab310	$C_{23}H_{16}N_6S_2\ O$	—	—	—	—	—	—	—	—	—	—	—	—	—
VIII	240	$C_{14}H_{14}N_6S\ O_2$	3450	3200	3100	2700	—	1620	1580	1450	1360	1250	1180	1000	900
IX	240	$C_{15}H_{14}N_6\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
X	160	$C_{15}H_{12}N_6S_2\ O_2$	3450	3200	3100	2700	—	1620	1570	1460	1340	1250	1190	1010	900
XI	ab310	$C_{16}H_{12}N_6S\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
XIIa	210	$C_{23}H_{19}N_7\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
XIIb	150	$C_{26}H_{24}N_6\ O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
XIIc	260	$C_{24}H_{17}N_7O_3$	—	—	—	—	—	—	—	—	—	—	—	—	—
XIIIa	255	$C_{23}H_{17}N_7\ O$	—	—	—	—	—	—	—	—	—	—	—	—	—
XIIIb	300	$C_{26}H_{22}N_6\ O$	—	—	—	—	—	—	—	—	—	—	—	—	—
XIIIc	250	$C_{24}H_{15}N_7O_2$	3400	3200	3100	—	1660	1600	1580	1440	1320	1250	—	870	840
XIV	245	$C_{30}H_{22}N_8S_4\ O_4$	3400	3250	3150	2750	1680	1600	1580	1480	1330	1250	1140	1020	850
XV	255	$C_{19}H_{13}N_5S_2\ O_3$	3400	3250	3150	2650	1720	1620	1580	1450	1340	1250	1130	1020	850
XVIa	130	$C_{22}H_{17}N_4S_3Cl^*O$	—	—	—	—	—	—	—	—	—	—	—	—	—
XVIb	ab310	$C_{34}H_{28}N_8S_4Cl^{**}{}_2O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
XVIc	ab310	$C_{44}H_{32}N_8S_4Cl^{***}{}_2O_2$	—	—	—	—	—	—	—	—	—	—	—	—	—
XVII	ab310	$C_{18}H_{16}N_4\ S_2O$	3380	—	3180	—	1680	1610	1570	1470	1350	1200	—	1000	950

* All the compounds were analysed for C,H,N, and S, the analytical results are within ± 0.5% of the theoritical values., Yield 65-85%, M.P. + Range 1-2°C, Found *Cl, 7.00, **Cl, 8.69, ***Cl 7.62; Cacl; Cl., 7.42%, ,Cl, 9.11%, Cl, 7.86%.

All the reaction sequences are reported in Scheme 1. The structure of the title compounds were confirmed by elemental analysis, IR, UV and PMR spectra (Table 1).

Biological activity. The effect of these triazinones on the amylolytic activity of some fungi were studied. Eleven fungal isolates from Egyptian cultivated soil were used to estimate the biological effect of the compounds.

Experimental. Culture medium used for amylase production was prepared according to the described method [7]. The pH was adjusted to 4.6, 0.01 g of each compound to


KOH
CS2
(X)
(VIII)
On cold
NH2NH2·H2O
Isopropanol
IIc
IIf
(IX)
KOH
CS2
(XI)
IIg–i
PhCONHNH2
(XII)
AcOH
(XIII)
(I)
EtOH
RR'C=O
(II)
R R'
a H -C6H4-SH-2
b H -Pyridyl-2
c H -Furyl-2
d H -Pyridyl-4
e CO2H -C6H4-NH2-2
f CH3 -Furyl-2
g CH3 -Pyridyl-4
h C2H5 CH2C6H5
i RR' Indol-2-one
j CH3 -C=N·C6H4-Tr-2, CH3
k C6H5 -C=N·C6H4-Tr-2, C6H5
l CH3 -CH2·C=N·C6H4-Tr-2, CH3
m C6H5 -CH2·C=N·C6H4-Tr-2, C6H5
n H
ArNH2
IIa
(III)
Ar. a C6H4-NH2-2
b C6H4-OH-2
c C5H4-SH-2
ClCOCH2Cl
(IV)
X. a NH
b O
c S
ClCH2CO2H
IIIa
AcOH
(V)
X a NH
b O
c S
(VI)
KOH
CS2
IIa
(VII)
MeI
KOH
(XVII)
SHAr
IIa, IIj, IIk
(XVI)
Ar -C6H4Cl-4
IIi
(XV)
SHCH2CO2H
IIn
(XIV)
Tr: 3-Thioxo-5-oxo-1,2,4-triazin-(2H,4H)6-yl

Scheme 1.

be tested was dissolved in an appropriate amount of DMF distilled water was added for a final volume of 100 ml. The substrate was dissolved in 100 ml saline phosphate buffer. In this trial, the test substance was icubated with the enzyme solution at pH 7.1 (0.2 M phosphate buffer) for 25 min. Amylase activity was assayed at the same pH and at 37° for 30 min. according to the method of Nelson [8] and Somogi [9].

TABLE 2. EFFECT OF SOME COMPOUNDS PREPARED ON THE ACTIVITY OF THE CRUDE AMYLASES

Test organisms/the compounds prepared	Final pH	Mycelial dry weight (mg50 ml culture med).	Amylolytic activity (mg reducing sugar/reaction mixture)													
			Control	I	IIa	IId	IIg	IIIa	IIIc	IV	VII	X	XIV	XVIa	XVIc	XVII
1. *Aspergillus flavus*	3.8	112	3.89	2.54	4.66	4.92	4.14	3.89	3.89	2.88	2.33	3.89	2.33	6.48	2.69	2.88
2. *Aspergillus fumigatns*	3.5	739	6.48	5.7	5.18	5.86	4.42	4.40	4.11	3.89	3.11	3.63	3.64	3.66	3.92	3.89
3. *Aspergillus nidulaus*	4.0	671	5.18	3.89	5.18	2.85	3.81	2.07	3.63	3.71	3.88	3.11	3.27	3.94	3.80	3.71
4. *Aspergillus niger*	3.3	110	3.37	3.63	4.92	7.26	4.40	3.63	3.89	4.66	4.14	4.92	7.51	5.20	5.18	4.66
5. *Aspergillus terreus*	3.8	133	5.18	5.18	5.96	5.20	5.20	4.92	5.70	3.37	3.37	2.85	5.13	4.92	4.77	3.37
6. *Aspergillus terricola*	3.9	828	5.70	5.18	5.70	5.44	3.89	4.77	3.89	4.40	3.37	6.22	6.48	4.14	3.37	4.40
7. *P.chermesmum.*	4.1	113	6.30	4.92	4.40	2.59	4.40	5.18	3.87	4.14	4.14	5.18	3.89	5.70	4.77	4.14
8. *P. chrysogenum*	4.3	105	4.15	3.63	3.50	4.01	4.12	3.22	3.57	3.21	3.14	3.71	4.11	4.14	4.77	3.21
9. *P. funiculosum*	3.5	145	6.48	2.85	3.39	2.59	2.07	4.14	2.85	3.11	2.33	3.37	2.85	5.96	5.77	3.71
10. *P. meleagrinum*	3.9	123	5.66	3.89	5.12	2.85	3.81	2.07	8.84	4.40	4.66	0.00	2.07	7.51	5.70	4.48
11. *Mucor spinosus*	4.0	102	3.56	5.19	5.18	2.85	2.59	3.89	3.63	4.76	4.14	2.33	5.44	5.70	3.37	4.76

The final pH and the mycelial dry weight for each fungus were also recorded (Table 2).

The results indicated that, under the experimental conditions employed, mycelial growth depends on the organism (Table 2). Of the eleven tested organisms, *Aspergillus terricola, A. fumigatus* and *A. nidulaus* showed the highest mycelial growth. The pH in all tested organisms was in the acidic range. Many organisms have been reported to produce acidic amylases [10,11]. The effect of the prepared compounds on fungal amylolytic enzyme was studied by incubating these substances with the enzyme solution at 37° for 30 min followed by addition of the amylase production (substrate) and estimating the activity in mg reducing sugar/wt. of reaction mixture as mentioned before. It was taken into consideration that such substances may affect the enzyme or the substrate or both and enhance the reaction. On the other hand, the enzyme activity of *Penicillium meleagrinum* was completely inhibited by compound (X).

In view of the above results we concluded that:

– Most of the tested compounds showed moderate activity.

– The mercapto triazinones (IIa, IIIc, XIV) and (XVIa) showed a strong effect in the order XIV>XVIa>IIIc>IIa towards all the tested organisms which could be attributed to the thiophenol, thioether and thiazolidin 4 one moieties.

– Replacement of the mercapto group in position-3 in the 1,2,4-triazinone (II) by substituted amino group (III) had no effect.

– The arylidine derivative (II) did not show good activity which may be due to the large dimensions of the molecule.

– The triazine derivatives showed a large effect towards the tested organisms especially, IIIc *(Penicillium meleagrinum)*, XIV *(Aspergillus niger* and *Aspergillus terricola)* and XVIa *(Aspergillus flavus and Mucor spinosus).*

Experimental

Melting points are uncorrected. UV spectra were recorded in distilled ethanol on a Perkin Elmer (550 S)UV *vis* - spectrophotometer (λ max in nm), IR spectra in KBr on a Pye Unicam S P 1100 Infrared spectrophotometer (υmax $^{cm-1}$) and PMR spectra were recorded on a Varian instrument EM 390 90 MHz NMR spectrometer in DMSO with TMS as internal stand and solvent (chemical shift in δ, ppm). Compound I was prepared by the procedure described by Doleschal *et.al* [1].

The arylidine derivatives IIa-1 : General procedure. A mixture of equimolar amounts of I and thiophenol-2-carboxaldehyde, pyridin-2-carboxaldehyde-furan-2-carboxaldehyde, pyridin-4-carboxaldehyde;2-aminophenylglycoxilic acid, 2-acetylfuran, 4-acetylpyridin, ethylbenzylketone or indol-2, 3- dione, in abs. ethanol (50 ml) was refluxed for 1 hr. left overnight and diluted with cold water. The solid obtained was filtered and crystallized from ethanol: DMF (1:1 v/v) to give IIa-i (Table 1).

The arylidine derivatives IIj-n : General procedure. A mixture of I(0.01 mol) and biacetyl, benzil, acetylacetone, dibenzoylmethane or *o*-phthaldehyde (0.01 mol) in abs. ethanol (50 ml) was heated under reflux for 1 hr. cooled and acdified with dil. HCl. The solid obtained was recrystallized from ethanol to give IIj-n (Table-1).

Aminolysis of IIa: Formation of 3-arylamino-6-(2-arylidinephenyl)-1,2,4-triazin-5-ones (IIIa-c): A mixture of IIa (0.01 mol) and primary aromatic amines (0.01 mol) in isopropyl alcohol (100 ml) was refluxed for 6-8 hr. The reaction mixture was concentrated under pressure. The solid obtained was recrystallized from ethanol to give IIIa-c (Table 1).

Acylation of IIIa-c with chloroacetyl chloride: .Formation of IVa-c. A mixture of equimolar amounts of IIIa-c and chloroacetyl chloride in ethanolic KOH (10%, 100 ml) was heated under reflux for 4 hr, cooled, diluted with cold water and filtered. The solid obtained was crystallized from ethanol to give IVa-c (Table 1).

Alkylation of IIIa-c with monochloroacetic acid: Formation of Va-c. A mixture of IIIa-c(0.01 mol) and monochloroacetic acid (0.01 mol) in aq. NaOH (5%, 100 ml) was refluxed for 4 hr. cooled and acidified with dil. HCl. The solid obtained was crystallized from DMF to give Va-c (Table 1).

1-[6-(2-Arylidinephenyl)-5-oxo-1,2,4-triazin-3-yl]2-methylbenzimidazole (VI). A mixture of IIIa (0.01 mol), gl. acetic acid (100 ml) and fused sodium acetate (5 g) was refluxed for 2 hr. cooled, diluted with cold water and filtered. The solid obtained was crystallized from acetic acid to give VI (Table 1); PMR (TMS): 2.4 (s, 3H, CH_3), 6.9 (s, 1H, = CH), 7-8(m, 12 H, aromatic protons), 9.8 (s, 1H, NH of 1,2,4-triazin-5-one), and 11.2, 12.5 (s, 1H, SH and OH at position-3,5 of 1,2,4-triazine which disapppeared by shaking with D_2O).

1-[6-(2-Arylidinephenyl)-5-oxo-1,2,4-triazin-3-yl] 2-mercaptobenzimidazole (VII). A mixture of IIIa (0.01 mol), KOH (1g) and CS_2 (0.03 mol) in ethanol (30 ml) and water (5 ml) was refluxed for 8 hr. cooled and neutralized. The solid obtained was filtered and crystallized from ethanol to give VII (Table 1).

Hydrazinolysis of II

(a) Formation of VIII. To a stirred solution of hydarzine hydrate (0.01 mol) in isopropyl alcohol (50 ml) was added slowly a solution of IIc (0.01 mol) in isopropyl alcohol (50 ml) at room temperature. After stirring the mixture for 10 min. it was diluted with cold water. The separated solid was filtered and crystallized from ethanol to give VIII (Table 1).

(b) Formation of IX:. Hydrazine hydrate (0.02 mol) was added to a solution of IIf (0.01 mol) in isopropyl alcohol (100 ml) and the reaction mixture refluxed for 6 hr and the solvent was removed and the residue washed with ethanol to give IX (Table 1).

Reaction of VIII and IX with CS_2: Formation of X and XI . A mixture of VIII or IX (0.01 mol), KOH (1 g) and CS_2 (0.03 mol) in ethanol (30 ml) and water (5 ml) was heated under reflux for 8 hr. cooled and neutralized. The solid precipitate was filtered and crystallized from methanol to give X and XI (Table 1).

1-(Benzoyl)-2-[6-(2-arylidinephenyl)-5-oxo-1,2,4-triazin-3- yl]-hydrazine (XIIa-c). A mixture of IIg-i(0.01 mol) and benzoic acid hydrazide (0.01 mol) in ethanol (100 ml) was refluxed for 8 hr. The separated solid was filtered and crystallized from ethanol to give XIIa-c (Table 1).

3-Phenyl-s-triazolo[4,5-b][1,2,4] triazinone derivative (XIIIa-c). A mixture of XIIa-c (0.01 mol) and gl. acetic acid (100 ml) was heated under reflux for 2 hr, cooled, diluted with cold water and filtered. The solid obtained was crystallized from ethanol to give XIIIa-c (Table 1).

Bisthiazolidin-4-one (XIV). A mixture of IIn (0.01 mol), dry dioxan (100 ml), fused Na_2SO_4 (100 g) and thioglycolic acid (0.02 mol) were refluxed for 10 hr [13]. The mixture was filtered while hot, the solvent was removed and the residue treated with a $NaHCO_3$ solution and filtered. The resultant solid was crystallized from ethanol to give XIV (Table 1), UV (in pure ethanol): 210, 285, 300 and 315 nm[12]; PMR (TMS): 2.5, 2.5 (s, 2H, CH_2 and 2H, CH_2 of two methylene groups in thiazolidin-4-one rings), 6.4 (s, 2H, -CH=N), 6.8-8 (m, 12 H, aromatic protons) and 11.2 (s, NH, of 1,2,4- triazine moiety which exchangebale with D_2O).

The Spiro compound XV. A mixture of IIi (0.01 mol) and indol-2,3-dione (0.01 mol) in dry benzene (100 ml) and ethylbenzene (100 ml) was refluxed for 2 hr, and the theoretical amount of water was collected azeotropically. After cooling the mixture, mercaptoacetic acid (0.012 mol) was added and the solution was refluxed again for 4 hr. The solvent was removed, the residue was treated with $NaHCO_3$ solution and the supernatant liquid decanted off. The resultant solid was crystallized from ethanol to give XV (Table 1).

Fusion of IIa, IIj, and IIk with p-chlorothiophenol Formation of XVIa-c. A mixture of IIa, IIj and or IIk (0.01 mol) and *p*- chlorothiophenol (0.02 mol) was fused at 170-180 in an oil-bath for 6 hr [13], and cooled. The solid obtained was triturated with methanol to give XVIa-c (Table 1).

3-Methylthio-6-(2-arylidinephenyl)-1,2,4-triazin-5-one (XVII). To a stirred solution of MeI (5 ml) in aq. KOH (1%, 50 ml) was added slowly a solution of IIa (0.01 mol) in aq. KOH (1 %, 50 ml) at room temperature. After stirring the mixture for 24 hr, it was concentrated and diluted with water. After acidification with dil. HCl, the separated solid was filtered

and crystallized from methanol to give XVII (Table 1).

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